








Author: Tung-Yuan Ho / Illustrator: Ya-Ling Huang / Translator: Claudia Chern and Tung-Yuan Ho

## Nickel Hypothesis

From A to Z is the advertisement of Centrum, the vitamin supplement company. Z stands for Zinc.  Organisms need essential trace metals, but if they consume too much they will get metal poisoning and if they consume too little their health will be greatly impaired. For example, the enzyme, superoxide dismutase (SOD), is essential to remove free radicals from the body. This enzyme requires Fe, Mn , or Cu  and Zn to become functional. Many key biochemical reactions in the body are catalyzed by enzymes. Enzymes  are mainly composed of amino acids. The most important part of an enzyme is the active site, where catalytic reactions take place. For most enzymes, trace metals are essential components in their active sites. Therefore, if an organism is lacking in a specific necessary metal or is unable to acquire an adequate amount, these metal requiring enzymes are unable to work. The organism's growth and reproduction will be limited. The transition from an anoxic to an oxic environment in the ocean was a critical turning point for biological evolution on Earth. The Nickel Hypothesis argues that the transition was caused by decreased supply of Ni in the ocean. For methanogens  to form methane, they need to use three critical nickel containing enzymes. If the supply in the ocean drops, the metabolism of the methanogen that uses nickel will also drop. Following, the production of methane will drop, and photosynthesizing phytoplankton had the chance to become dominant in the ocean. Oxygen was then able to begin accumulating in the ocean and in the atmosphere, resulting in the evolution of marine and terrestrial organisms (Konhauser et al. 2009). Nickel is an element in the iron group with a relatively high melting and boiling point. In the early oceans, nickel mainly originated from high temperature eruptions from volcanoes. As the  Earth gradually cooled and volcanic activity decreased, this supply also quickly decreased. In 2009, a Canadian scientist Konhauser and his colleagues observed the decreasing  trend of nickel content in rocks and proposed the Nickel Hypothesis mentioned above.

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